

MEDICINE LAKE NATIONAL WILDLIFE REFUGE

MEDICINE LAKE, MONTANA

ANNUAL WATER MANAGEMENT PLAN

1980

Including a water use resume for years 1974 through 1979.

UNITED STATES DEPARTMENT OF THE INTERIOR

FISH AND WILDLIFE SERVICE

MEDICINE LAKE NATIONAL WILDLIFE REFUGE

MEDICINE LAKE, MONTANA

ANNUAL WATER MANAGEMENT PLAN - 1980

I. Record of 1979 Water Use

A. Source of Supply

Run-off water from melting snows in March and April provided the major water supply for all refuge impoundments. No significant rainfall fell during the year and no run-off could be attributed to it. Groundwater levels appeared to keep some impoundments at a higher level than usual until late fall.

B. Type of Rights

The U.S. Fish and Wildlife Service through filings posted and recorded hold appropriated water rights as shown below. Also, some of the older wells and watering ponds have vested groundwater rights.

WATER RIGHTS FILING NUMBER	SOURCE	AMOUNT OF WATER RIGHT	ACRES UNDER WATER RIGHTS AND STORAGE RIGHTS
✓ 233163 ✓	Cottonwood Creek	100 cfs	3640
✓ 233164 ✓	Sand Creek	75 cfs	3640
✓ 233165 ✓	Lost Creek	25 cfs	840
✓ 233166 ✓	Sheep Creek	20 cfs	750
242886 1970	Sheep Creek	300 cfs	2287
✓ 233167 ✓	Lake Creek	100 cfs	3640 ^{acres in.} and 3200 A/F storage
✓ 233168 ✓	Big Muddy Creek	50 cfs	1600 ^{acres in.}
✓ 233169 ✓	Big Muddy Creek	1200 cfs	2000 ^{acres in.} and 55,000 A/F storage
Vested groundwater	Sandhills Well #1 ✓	3gpm	
Appropriated ground- water - no number	Sandhills Well #2 ✓	3 gpm	
Vested groundwater	Headquarters Well ✓	300 gpm	
Appropriated ground- water - no number	Headquarters Well ✓	25 gpm	
373059	Headquarters Well	25 gpm	
Vested groundwater	Stock Watering Pond #3 ✓	5 gpm	
Vested groundwater	Stock Watering Pond #4 ✓	5 gpm	
Vested groundwater	Stock Watering Pond #5 ✓	5 gpm	
Vested groundwater	#2 Reed's Pond ✓	10 gpm	
Vested groundwater	#1 (Merganser Pond) ✓	10 gpm	

C. Purpose of Use

All appropriated creek waters were used for irrigation of lakes and marshes to produce wildlife food and habitat. Storage of water was for late season water needs and for the overwintering of fish and wildlife populations.

All wells and ponds were used for wildlife, livestock, and domestic purposes.

D. Season of Use

The main season of water use is generally from mid-March until the first part of December. The water impoundments are usually frozen over from early December through the end of March every year. The winter season use is necessary to carry over resident fish and wildlife populations.

The wells and ponds are generally in use by wildlife and livestock from mid-March thru the first part of December and the headquarters well is used year round for domestic purposes.

E. Quantity Used

A total of 97,979 acre feet of water entered the refuge via creek channels during the 1979 spring run-off period. No other run-off water was received during the year. Of this total amount received, the refuge diverted 86,643 acre feet of excess water from Medicine Lake to the Big Muddy Creek via Lake Creek and from Homestead Lake to the Big Muddy Creek via #6 Spillway. Total use by the refuge was 10,336 acre feet of water.

An estimated twelve acre feet of water was pumped from four refuge wells. No data is available on the amount of water used in the watering ponds.

F. Place of Use

The summary table shows the water deficiency of each impoundment before run-off in 1979 and the tributaries on which the refuge has water rights that fill these impoundments.

AREA	DEFICIENCY IN ACRE FEET	TRIBUTARY STREAM
Homestead Lake	4199	Big Muddy Creek Lost Creek Sheep Creek
Gaffney Lake	214	Cottonwood Creek Lake Creek Sand Creek
#10 Lake	23	Cottonwood Creek Lake Creek Sand Creek
Deep Lake	23	Cottonwood Creek Lake Creek Sand Creek
Long Lake	30	Cottonwood Creek Lake Creek Sand Creek
#11 Lake	174	Cottonwood Creek Lake Creek Sand Creek
#12 Lake	286	Lake Creek
Katy's Lake	183	Lake Creek
Medicine Lake	520 ⁵	Big Muddy Creek

10,337

G. Adequacy of Supply

The water level in all impoundments filled to capacity during mid-April and all excess water was diverted from the refuge.

The following table shows the amount of water received from each tributary stream during 1979.

Big Muddy Creek	57,562	Acre feet
Lost Creek	5,220	Acre feet
Sheep Creek	7,017	Acre feet
Sand Creek	2,363	Acre feet
Cottonwood Creek	16,043	Acre feet
Lake Creek	9,774	Acre feet

Precipitation was almost nill after the first of July and impoundments suffered noticeably. High water tables from the previous wet year (1978) kept levels higher than they normally would have been. The following chart shows monthly water levels in our major impoundments during 1979.

MONTHLY RECORD OF GUAGE READINGS - 1979

IMPOUNDMENT OPERATIONAL LEVEL	Homestead	Gaffney's	#10	Deep	Long	#11	#12	Katy's	Medicine
	Lake	Lake	Lake	Lake	Lake	Lake	Lake	Lake	Lake
	1937.85	1944.50	1946.00	1945.00	1944.50	1952.54	1955.93	1956.00	1943.02
JANUARY	1934.60	1944.00	1945.72	1944.33	1944.00	1951.62	1955.16	1955.19	1942.40
FEBRUARY	1934.60	1944.00	1945.72	1944.33	1944.00	1951.62	1955.16	1955.19	1942.40
MARCH	1934.60	1944.00	1945.72	1944.33	1944.00	1951.62	1955.16	1955.19	1942.40
APRIL	Over guage	*	1947.23	*	*	1953.94	1956.61	1955.65	1945.12
MAY	1937.45	*	*	*	*	1952.22	1955.16	1956.70	1943.80
JUNE	*	*	*	*	*	1951.80	1955.48	*	*
JULY	*	*	*	*	*	1951.52	1955.20	*	*
AUGUST	1936.20	*	*	*	*	*	*	*	*
SEPTEMBER	1935.40	*	*	*	*	1950.96	1954.26	*	1942.00
OCTOBER	1936.45	*	*	*	*	1950.80	1954.12	*	*
NOVEMBER	1936.28	1943.22	1944.72	1944.00	1943.22	1951.02	1954.26	1954.52	1941.60
DECEMBER	1936.28	1943.22	1944.72	1944.00	1943.22	1951.02	1954.26	1954.52	1941.60

* Not available

All readings are for the middle of the month.

It should be noted that new water gauges are being installed on all impoundments for the 1980 water year. Some of the impoundments never had a separate water gauge and other gauges had fallen into disrepair.

Given below is a chart of the comparison of deficiencies in unit water levels on January 1 from 1974 to 1980.

<u>WATER DEFICIENCY - ACRE FEET NEEDED</u>							
<u>IMPOUNDMENT</u>	<u>1974</u>	<u>1975</u>	<u>1976</u>	<u>1977</u>	<u>1978</u>	<u>1979</u>	<u>1980</u>
Homestead Lake	4457	2648	1589	2002	2648	4199	2028
Gaffney Lake	427	427	*	641	842	214	547
#10 Lake	109	89	*	131	97	23	23
Deep Lake	69	52	*	52	57	23	34
Long Lake	89	89	*	89	149	30	76
#11 Lake	318	386	250	307	462	174	288
#12 Lake	916	991	1785	968	1324	286	620
Katy's Lake	588	588	325	484	339	183	334
Medicine Lake	15279	11249	3862	9738	19980	5205	11921
Totals	22252	16519	7811	17795	13871	6222	12410
* At or above operational level.				74	75	76	77

II. Recommendations for 1980

The refuge will need 15,871 acre feet of all impoundments to operational level. A six years has been in excess of 67,000 ac a dry run. As of this writing (late March) trends don't indicate much moisture.

The following recommendations are offered Lake National Wildlife Refuge during 1980

1. Install new water gauges in all impoundments and see for readings.

- ✓ 2. Recalculate operational levels for all impoundments in relation to the new gauges.
- ✓ 3. Initiate water chemistry, i.e. salinity and conductivity, on all impoundments; on all inflows; and on all discharges.
- ✓ 4. All impoundments should be filled to operational level as early as possible.
- ✓ 5. Homestead Lake has a high botulism potential. The last two years it was necessary to drawdown this lake to help combat this disease. If the disease breaks out again, we recommend that the unit be drawn down completely. We also recommend that the lake be refilled after the disease danger has passed. The lake can be refilled by releasing water from Medicine Lake.
- ✓ 6. If we don't receive spring run-off to fill Homestead Lake to within at least one foot of operational level (it is presently 1.57 foot below operational) we recommend a release of water from Medicine Lake to make up the difference. If water were taken from Medicine Lake it would utilize approximately 750 acre feet.
7. Hold water as high as possible in Medicine Lake (except for above noted recommendations) to accomplish several refuge objectives. These objectives would include:
 - ✓ A. Increase waterfowl production by providing more available pair areas.
 - ✓ B. Provide spawning habitat for northern pike. This assures a good population of northerns to help biologically control carp and also it provides for additional recreational visits.
 - ✓ C. Provide additional nesting habitat for grebes and other over-the-water nesting birds.
 - ✓ D. Insure adequate water levels for over wintering resident fish and wildlife populations.
- ✓ 8. Water in excess of what is needed to obtain approved operational levels will be diverted downstream to the next impoundment. Excess water in Medicine Lake or Homestead Lake will be released back into the Muddy Creek drainage.
- ✓ 9. Once construction work is completed on the diversion structure, every effort should be made to keep silt laden water from the Big Muddy Creek from entering the refuge. The water should be by-passed through the number one control structure and then on down the Big Muddy Creek.

10. Proposed Water Use Priority

<u>Unit</u>	<u>Purpose</u>	<u>Priority</u>
Homestead Unit	Nesting and Brooding	1
Gaffney Lake	Nesting and Brooding	1
#10 Lake	Nesting and Brooding	1
Deep Lake	Nesting and Brooding	2
Long Lake	Nesting and Brooding	2
#11 Lake	Nesting and Brooding	1
#12 Lake	Nesting and Brooding, Storage	2
Katy's Lake	Nesting and Brooding	1
Medicine Lake	Nesting and Brooding, Storage, Fish rearing	2

How about direct precip
over lakes
Evap could be
accurately
determined then

1979 RESUME

MEDICINE LAKE NATIONAL WILDLIFE REFUGE

1979 Water Flow Data and Water Deficiency

Water deficiency in acre feet on January 1, 1979 - 10,336.11 *sh*

Total water flow in acre feet received by the refuge:

Spring flow - 97,979 *sh*

Summer flow - Negligible

Excess water in acre feet diverted from the refuge - 89,258 *sh*

Spring flow - 87,643 ✓

Homestead drawdown - 1,615

Water deficiency in acre feet on December 31, 1979 - 15,872 *sh*

Total water in acre feet utilized by the refuge - 10,336 *sh*
(Diverted and Not Returned to Stream)

97,979
87,643
10,336

1979 Water flows Received by Tributary

97,979 - 87,643

Big Muddy Creek	57,562 Acre feet
Lost Creek	5,220 Acre feet
Sheep Creek	7,017 Acre feet
Sand Creek	2,363 Acre feet
Cottonwood Creek	16,043 Acre feet
Lake Creek	9,774 Acre feet

97,979

1979 WATER DEFICIENCY

	Elevation 01/01/79	Operating Elevation	Elevation Difference	Acre feet Needed	Surface Acres at Oper. Level
Homestead Lake	1934.60	1937.85	3.25	4198.68	1291.9
Gaffney Lake	1944.00	1944.50	.5	213.70	427.4
#10 Lake	1945.72	1946.00	.28	23.30	83.2
Deep Lake	1944.33	1945.00	.67	23.10	34.4
Long Lake	1944.00	1944.50	.5	29.80	59.6
#11 Lake	1951.62	1952.54	.92	174.10	189.2
#12 Lake	1955.16	1955.93	.77	285.67	371.0
Katy's Lake	1955.19	1956.00	.81	183.06	226.0
Medicine Lake	1942.40	1943.02	.62	5204.78	8394.8

10,336

1978 RESUME

MEDICINE LAKE NATIONAL WILDLIFE REFUGE

1978 Water Flow Data and Water Deficiency

Water deficiency in acre feet on January 1, 1978 - 25,899

Total water flow in acre feet received by the refuge - 80,860

Spring flow - 59,427

Summer flow - 21,433

Excess water in acre feet diverted from the refuge - 46,228

Spring flow - 33,528

Summer flow - 10,000

Homestead drawdown - 2,700

Water deficiency in acre feet on December 31, 1978 - 10,336

Total water in acre feet utilized by the refuge in 1978 - 37,332 ✓

80,860
46,228
34,632

1978 Water Flows Received by Tributaries

	<u>Spring</u>	<u>Summer</u>	
Big Muddy Creek	50,776	9,728	60,504
Lost Creek	749	140	889
Sheep Creek	1,759	1,200	2,959
Sand Creek	1,577	937	2,514
Cottonwood Creek	3,448	7,299	10,747
Lake Creek	418	1,129	1,547
Miscellaneous Tributaries	700	1,000	1,700
	59,427	21,433	

1978 Water Deficiency

	Elevation 01/01/78	Operating Elevation	Elevation Difference	Acre Feet Needed	Surface Acres at Oper. Level
Homestead Lake	1935.80	1937.85	2.05	2648.40	1291.9
Gaffney Lake	1942.53	1944.50	1.97	841.98	427.4
#10 Lake	1943.83	1945.00	1.17	97.34	83.2
Deep Lake	1943.33	1945.00	1.67	57.45	34.4
Long Lake	1942.00	1944.50	2.50	149.00	59.6
#11 Lake	1950.10	1952.54	2.44	461.65	189.2
#12 Lake	1952.36	1955.93	3.57	1324.47	371.0
Katy's Lake	1954.50	1956.00	1.50	339.00	226.0
Medicine Lake	1940.64	1943.02	2.38	19979.62	8394.8

25,899 ✓

1977 RESUME

MEDICINE LAKE NATIONAL WILDLIFE REFUGE

1977 Water Flow Data and Water Deficiency

Water deficiency in acre feet on January 1, 1977 - 14,411.59

Total water flow in acre feet received by the refuge - negligible

Spring flow - negligible

Summer flow - negligible

Excess water in acre feet diverted from the refuge - none.

Water deficiency in acre feet on December 31, 1977 - 25,899

Total water in acre feet utilized by refuge in 1977 - none.

1977 Water Flows Received by Tributaries

None

1977 Water Deficiency

	Elevation 01/01/77	Operating Elevation	Elevation Difference	Acre feet Needed	Surface Acres at Oper. Level
Homestead Lake	1936.30	1937.85	1.55	2002.45	1291.9
Gaffney Lake	1943.00	1944.50	1.50	641.10	427.4
#10 Lake	1944.43	1946.00	1.57	130.62	83.2
Deep Lake	1943.50	1945.00	1.50	51.60	34.4
Long Lake	1943.00	1944.50	1.50	89.40	59.6
#11 Lake	1950.92	1952.54	1.62	306.50	189.2
#12 Lake	1953.32	1955.93	2.61	968.31	371.0
Katy's Lake	1953.86	1956.00	2.14	483.64	226.0
Medicine Lake	1941.86	1943.02	1.16	9737.97	8394.8

1976 RESUME

MEDICINE LAKE NATIONAL WILDLIFE REFUGE

1976 Water Flow Data and Water Deficiency

Water deficiency in acre feet on January 1, 1976 - 7810.34 ✓

Total water flow in acre feet received by the refuge - 115,868

Spring flow - 115,868

Summer flow - Negligible

Excess water in acre feet diverted from the refuge - 108,058

Spring flow - 108,058

Water deficiency in acre feet on December 31, 1976 - 14,411.59

Total water in acre feet utilized by refuge in 1976 - 7810.34 ✓

115 868
108 058

7810

1976 Water Flows by Tributaries

Big Muddy Creek	85,860
Lost Creek	3,453
Sheep Creek	6,586
Sand Creek	928
Cottonwood Creek	10,993
Lake Creek	8,048

1976 Water Deficiency

	Elevation 01/01/76	Operating Elevation	Elevation Difference	Acre Feet Needed	Surface Acres at Oper. Level
Homestead Lake	1936.62	1937.85	1.23	1589.04	1291.9
Gaffney Lake	1945.23	1944.50	----	----	427.4
#10 Lake	1945.23	1945.00	----	----	83.2
Deep Lake	1945.23	1945.00	----	----	34.4
Long Lake	1945.23	1944.00	----	----	59.6
#11 Lake	1951.22	1952.54	1.32	249.74	189.2
#12 Lake	1951.12	1955.93	4.81	1784.51	371.0
Katy's Lake	1954.56	1956.00	1.44	325.44	226.0
Medicine Lake	1942.56	1943.02	.46	3861.61	8394.8

1975 RESUME

MEDICINE LAKE NATIONAL WILDLIFE REFUGE

1975 Water Flow Data and Water Deficiency

Water deficiency in acre feet on January 1, 1975 - 16,519 ✓

Total water flow in acre feet received by the refuge - 80,141

Spring flow - 80,141

Summer flow - negligible

Excess water in acre feet diverted from the refuge - 63,622

Spring flow - 63,622

Water deficiency in acre feet on December 31, 1975 - 7910.34

Total water in acre feet utilized by the refuge in 1975 - 16,519 ✓

80,141
63,622

16,519

1975 Water Flows by Tributaries

Big Muddy Creek	55,831
Lost Creek	773
Sheep Creek	9,746
Sand Creek	1,497
Cottonwood Creek	7,972
Lake Creek	4,322

1975 Water Deficiency

	Elevation 01/01/75	Operating Elevation	Elevation Difference	Acre Feet Needed	Surface Acres at Oper. Level
Homestead Lake	1935.80	1937.85	2.50	2648.4	1291.9
Gaffney Lake	1943.50	1944.50	1.00	427.4	427.4
#10 Lake	1943.93	1945.00	1.07	89.0	83.2
Deep Lake	1943.50	1945.00	1.50	51.6	34.4
Long Lake	1943.00	1944.50	1.50	89.4	59.6
#11 Lake	1950.50	1952.54	2.04	386.0	189.2
#12 Lake	1953.26	1955.93	2.67	990.6	371.0
Katy's Lake	1953.40	1956.00	2.60	587.6	226.0
Medicine Lake	1941.68	1943.02	1.34	11249.0	8394.8

1974 RESUME

MEDICINE LAKE NATIONAL WILDLIFE REFUGE

1974 Water Flow Data and Water Deficiency

Water deficiency in acre feet on January 1, 1974 - 22,252.03 ✓

Total water flow in acre feet received by the refuge - 49,505

Spring flow - 49,505

Summer flow - negligible

Excess water in acre feet diverted from the refuge - 27,253

Spring flow - 27,253

Water deficiency in acre feet on December 31, 1974 - 16,519

Total water in acre feet utilized by refuge in 1974 - 22,252.03 ✓

49,505
27,253
22,252

1974 Water Flows by Tributaries

Big Muddy Creek	40,808
Lost Creek	82
Sheep Creek	144
Sand Creek	684
Cottonwood Creek	2,827
Lake Creek	4,960

1974 Water Deficiency

	Elevation 01/01/74	Operating Elevation	Elevation Difference	Acre Feet Needed	Surface Acres at Oper. Level
Homestead Lake	1934.40	1937.85	3.45	4457.06	1291.90
Gaffney Lake	1943.50	1944.50	1.00	427.40	427.40
#10 Lake	1943.69	1945.00	1.31	109.00	83.20
Deep Lake	1943.00	1945.00	2.00	68.80	34.40
Long Lake	1943.00	1944.50	1.50	89.40	59.60
#11 Lake	1950.86	1952.54	1.68	317.86	189.20
#12 Lake	1953.46	1955.93	2.47	916.37	371.00
Katy's Lake	1953.40	1956.00	2.60	587.60	226.00
Medicine Lake	1941.20	1943.02	1.82	15,278.54	8394.80

LAMESTEER NATIONAL WILDLIFE REFUGE

WIBAUX, MONTANA

Annual Water Program - 1980

427 acre-feet
storage at
elev. 99.0

1. Source of Supply

Spring snow-melt water and heavy rainfall run-off are the only water suppliers of Lamesteer reservoir. Almost all water enters the reservoir via Lamesteer Creek.

2. Type of Rights

A "Notice of Appropriation of Water" claiming 427 acre feet of water from Lamesteer Creek was posted on June 30, 1938, over the signature of Wilbert A. Rodgers, Administrative Assistant, Bureau of Biological Survey, as authorized agent for the Secretary of Agriculture. The fact of posting was recorded in Book 6 of Miscellaneous on Page 345 in the Wibaux County Recorder's Office, Wibaux, Montana, on July 16, 1938.

3. Purpose of Use

During the 1979 water season, water was used for wildlife purposes and irrigation of cropland.

(Special use permit from Refuge) 1978
In 1978, the landowner at Lamesteer Refuge sold his land to Albin Beggar. Mr. Beggar applied for irrigation rights out of the reservoir. The original appropriated right called for irrigation use as well as wildlife use. By going back over the past years water data, we calculated water which would normally be excess to wildlife needs. Water may be pumped from the reservoir during prescribed dates when the water level is at or above the following elevations:

April 1 to July 15 - .5 ft. below spillway (Elev. 8.50)
July 16 to Sept. 15 - 1.0 ft. below spillway (Elev. 8.00)
Sept. 16 to Oct. 15 - 1.5 ft. below spillway (Elev. 7.50)

4. Season of Use

Water usage on the refuge is on a yearlong basis with the major use from April 1 to November 30. Evaporation and transpiration is very high from this reservoir during the summer and fall months.

5. Quantity Used

The only water supply during 1979 was from spring snow melt. This early run-off filled the reservoir to capacity. Total diverted water was estimated to be 160 acre-feet. All excess water was diverted over the reservoirs spillway and entered Beaver Creek.

6. Place of Use

All appropriated waters were used within the high water limits of Lamesteer reservoir. The reservoir is located in the SE $\frac{1}{4}$ of Section 14 and all of Section 15, T21N, R60E of Montana Principal Meridian, Wibaux County, Montana.

7. Adequacy of Supply

Spring water flows filled the reservoir to capacity and high groundwater levels kept the reservoir at a fairly constant level throughout the summer. At years end, the reservoir was approximately 1.5 feet below operational level which is normal.

8. Recommendations for 1980

The Lamesteer spillway is non-adjustable and the water is impounded up to crest elevation. It is again our recommendation to fill the reservoir to spillway elevation with spring flows.

We also recommend that the irrigation permit be issued to Mr. Beggar with the same pumping limits. Unless we receive substantial rainfall the water outlook in the Lamesteer reservoir looks very slim for wildlife and much slimmer for Mr. Beggar.

During a 10 year period, 1968 to 1978, there was an average of 1.68 feet of silt deposited in Lamesteer reservoir. If this accelerated siltation rate continues, we predict the reservoir will be of little wildlife value in the very near future.

We have also had reports over the past two years of seismograph water trucks taking water from the reservoir. This may need some action if the visits become more frequent during the summer months.

NORTHEASTERN MONTANA WETLANDS

SHERIDAN, ROOSEVELT AND DANIELS COUNTIES, MONTANA

Annual Water Program - 1980

1. Source of Supply

The marshes, lakes, and ponds are almost entirely dependent upon spring run-off for their water. Only occasionally will summer rain provide enough run-off to help the wetlands.

2. Type of Rights

The Fish and Wildlife Service has not filed water rights on any wetlands in the district. The only rights we have at the present are use rights. A private landowner has filed rights on the lake on which Sheridan County Tracts 42 and 66 are located.

3. Purpose of Use

All water received is used for wildlife purposes, water conservation, and recreation.

4. Season of Use

The water is used on a yearlong basis with major use coming from April 1 to November 30. Retention of water in the deeper basins is important for overwinter resident wildlife populations.

5. Quantity and Place of Use

At this time we are conducting no flow rates of water into the wetland basins. Snow melt in the spring of 1979 provided abundant water and many basins lost water over natural spillways. We do have one diversion dam located on the Johnson Lake WPA in Roosevelt County. This dam is located on a meandered lake and impounds approximately one additional foot of water over the lakes basin. The source of the run-off water is from several un-named tributaries of the Big Muddy Creek.

6. Adequacy of Supply

Since prairie potholes are a natural constituent of the landscape, they fluctuate with the areas weather. Some years there is excellent water conditions (1979) and some years there is none (1977). Whatever the case may be in the life of a prairie pothole the water supply is adequate if it is natural and not being influenced by man's activities.

7. Recommendations for 1980

- A. The fall surveillance flight should be flown as late as possible before snowfall to check for burning, drawing, or filling on lands covered by wetland easements.
- B. Initial work should be started on the filing for water rights on all of the refuges wetland basins located in the district. This would include legal descriptions, basin sizes, and capacities.
- C. Water chemistry measurements should be taken on several of the larger lakes especially in heavily cultivated areas with some control readings being taken in lakes that are primarily in grassland areas.

Submitted by: Jay R. Bellzini

Station: Medicine Lake NW Refuge

Date: March 31, 1980

Approved by: _____

Date: _____